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Verbal Behavior and Initial Exposure to Delayed Reinforcement

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Ten subjects responded under a tandem fixed-ratio 1 not-responding-greater-than-*t* schedule of point delivery during one 75-min session in which the delay was either 10 or 20 s. Subjects were asked to describe the contingencies throughout the session. Although studies with nonhumans have demonstrated response acquisition under similar delayed-consequence procedures, a minority of subjects in the current study demonstrated sensitivity to delayed consequences convincingly. All subjects exhibited inefficient patterns of responding and descriptions of nonexistent contingencies. Subjects who demonstrated learning were more likely to verbalize the actual contingencies, but this was not true in all cases. Furthermore, some subjects who demonstrated learning did not describe the delay contingency. Results suggest that learning may occur in the absence of a person's ability to describe environment–behavior relations.

During the past decade, a number of investigators have reported that naive organisms can acquire new operant behavior when reinforcement is delayed. Such findings have been replicated with various delay lengths (Avila & Bruner, 1995), procedures (Critchfield & Lattal, 1993; Sutphin, Byrne, & Poling, 1992), and species (Lattal & Gleeson, 1990; Lattal & Metzger, 1994). Although reinforcement delays do retard learning, these studies call into question the once-prominent tenet that reinforcement must be immediate in order for learning to occur (see Grice, 1948; Malott, Whaley, & Malott, 1997; Michael, 1993; Skinner, 1953). To date, similar procedures have not been used to study human behavior.

Historically, delayed reinforcers were considered to be ineffective, and alternative explanations were proposed to account for instances in which human behavior appeared to be controlled by temporally noncontiguous consequences. Two general types of explanations were posited. First, operant behavior almost always produces some immediate change in the environment. This change can come to control behavior as an immediate conditioned reinforcer; the delayed reinforcer does not directly strengthen the response that produced it. For example, pressing a button on an elevator panel may produce a lighted button as an immediate consequence and access to an elevator as a delayed consequence. Another explanation posited for human behavior is that, because humans are verbal, delays between a response and reinforcer can be mediated by verbal behavior. For example, one may respond to the phrase "if you enter your name in the registry, you will receive a free magazine in a few weeks." The magazine arriving 2 weeks later has no direct control over writing in a registry. Thus, behavior that appears to be under the control of delayed consequences may actually be rule governed.

The question remains whether delayed consequences affect human behavior directly. Research with nonhuman organisms has eliminated verbal mediation as a controlling variable. Such research shows response acqui-

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sition with reinforcement delays of up to about 30 s (Dickinson, Watt, & Griffiths, 1992; Sutphin et al., 1998). Whether behavior can be acquired in the absence of any immediate consequence is a question that may be impossible to answer; all operants cause immediate response-produced stimuli (for a discussion, see Critchfield & Lattal, 1993; Schlinger & Blakely, 1994). However, it is possible to show that behavior is acquired when programmed consequences are never presented immediately after a response (Sutphin et al., 1998).

Although it is not necessary to explain acquisition with delayed reinforcement, verbal behavior may play a role in mediating delayed consequences. It often appears that humans have the ability to self-generate verbal behavior that describes the delay between responding and delayed consequences. In many cases, the ability to verbalize contingencies develops concurrently with the acquisition of schedule control; the consequences shape both nonverbal and verbal behavior simultaneously. Rosenfarb, Newland, Brannon, and Howey (1992) analyzed self-generated rules in humans acquiring schedule performance under a multiple differential-reinforcement-of-low-rate 5-s fixed-ratio (FR) 8 schedule. Some subjects did not generate accurate rules until after they had earned reinforcers. This suggests that, in some cases, reinforcers control the generation of verbal behavior; therefore, verbal behavior may not be necessary to engender learning.

The current study was designed to analyze the verbal behavior of human volunteers performing under conditions of delayed reinforcement. We adopted procedures developed by Sutphin et al. (1998) to study acquisition with delayed reinforcement in water-deprived rats. Those authors employed a two-lever procedure. One lever, termed the reinforcement lever, produced reinforcers according to a tandem FR 1 not-responding-greater-than-*t* schedule. The first response initiated a delay interval of *t* s, after which water was delivered for 4 s. Responses on the reinforcement lever during the delay interval reset the interval. Presses on the other lever, the cancellation lever, during a delay interval canceled the upcoming reinforcer. Presses on this lever at other times had no programmed consequence. Such a procedure guarantees that lever pressing can never be followed by an immediate programmed reinforcer. Substantial differences in levels of responding on the reinforcement and cancellation levers provided clear evidence of sensitivity to delayed reinforcement and allowed for a within-subject analysis. In rats, this procedure provided strong evidence that consequences delayed by up to 32 s affected behavior.

This procedure was used in the current investigation for three reasons. First, the procedure was developed to study response acquisition which is, by definition, behavior in transition. Therefore it may also be useful to assess changes in verbal behavior over time. Second, the procedure guarantees the integrity of delayed programmed consequences. Because the learning history of any particular adult human is unknown and invariably includes responding on a multitude of operanda, the acquisition of behavior per se was not studied; rather, conditions were arranged to examine whether delayed consequences would come to control behavior emitted in a novel environment. It is difficult, if not impossible, to find analogous schedule conditions outside of the laboratory. Therefore any rule already in a subject's repertoire would probably not facilitate learning. Finally, the current investigation extended previous investigations of self-generated verbal behavior (e.g., Catania, Matthews, & Shimoff, 1982; Rosenfarb et al., 1992) in that instructions given to subjects did not contain any reference to the relevant operanda. In other words, subjects had to learn what operanda produced reinforcers through contact with programmed contingencies only.

METHOD

Subjects

Twelve (4 male and 8 female) undergraduate psychology students, ages 17 to 38 years, participated. For all subjects, participation helped to fulfill part of a course requirement.

Apparatus

Experimental sessions were conducted in a dimly lit cubicle (2 m by 3 m). Subjects sat in front of a response panel (BRS/LVE) that contained a red stimulus light, two white stimulus lights, two counters, and a letter-projection screen. A response lever (Lafayette Instruments) was located to the left and right sides of the panel. Another table was located to the left of the subject. A wooden box was placed on top of this table along with nine questionnaires and a pen. A small metal box containing two buttons was also placed on the table. One button was labeled "start." Programming of experimental events and data recording were controlled by a microcomputer equipped with MED-PC® software.

Procedure

All subjects were exposed to one experimental session. Subjects were escorted to a seat inside the cubicle. An experimenter read the following instructions:

> In this study, your task is to learn how to earn points. You can earn points by manipulating something on the table in front of you. You will be done with the experiment as soon as you earn 60 points. Even if you earn 60 points very quickly, you will still be given two hours of research credit for your introductory psychology class. Every time you earn a point, this white light will illuminate for one second, and this counter will display your point total. I cannot tell you anything else about how to earn points. Every once in a while, this red light will turn on after you earn a point. When this happens, please fill out one of the sheets on your left. Answer the questions as best as you can, and please print neatly. When you are done with the sheet, place it in the box. Then, press the start button and try to earn more points. The experiment will end after you have earned 60 points, or after a time limit of 75 minutes has passed. At that time I will provide you with some more information about this research. Do you have any questions at this time?
> [Informed consent procedure implemented here]
> I will now go and start the experiment. I will be in the next room until the experiment is over. Press the start button to begin. When you see the word "Go" appear here, you can try to earn points.

The experiment began as soon as the subject pressed the start button. Subjects were randomly assigned to one of two delay values (10 or 20 s). Subjects were exposed to a tandem FR 1 not-responding-greater-than-t schedule on one lever (the reinforcement lever). Under this procedure, the first press of the reinforcement lever initiated a delay of t s, after which the reinforcer was delivered. The reinforcer consisted of a 0.5-s illumination of a white stimulus light and a 1-point increment on a counter. Responses on the other lever (the cancellation lever) during a delay interval (t) canceled the scheduled reinforcer delivery. Responses on the cancellation lever at other times had no programmed consequences, but were recorded. Allocation of function to left and right levers was randomized.

During the session, the word "GO" was illuminated on the projection screen. Sessions ended after subjects earned 60 points, or after a time limit of 75 min expired. Responses on the two levers as well as point deliveries were recorded in 1-min bins across the course of the session. There was no communication between the subject and experimenter during the session.

As indicated in the instructions, a red stimulus light was illuminated after certain point deliveries. When this occurred, the program was suspended, the "GO" stimulus was shut of, and no consequences were provided for lever pressing. This occurred after the 2nd, 4th, 6th, 8th, 15th, 25th, 35th, 45th, and 55th point deliveries. Pilot data suggested that these point deliveries would be separated by roughly equal time intervals. Subjects filled out one

questionnaire each time this occurred and deposited the completed questionnaire through a slot in the wooden box. Each questionnaire was identical and included the following:

> Please describe how to earn points. If you are not sure, take your best guess. Provide enough detail so that someone else could earn points by following your instructions. Please print neatly in the space below.
> When you are done answering the questions above, fold this paper in half and place it in the wooden box. Then, press the start button and try to earn points again.

Programmed events resumed after the subject pressed the start button.

Questionnaires were coded at the top to correspond with the latest point delivery. At the conclusion of the session, subjects were asked to rewrite any words that were deemed illegible by the experimenter. These words were written directly above the original response. Written descriptions were later entered verbatim into a word-processing program. The descriptions were then scored according to two criteria: (a) Behavior controlled by the description would be successful in producing a point if followed as an instruction, and (b) the subject indicated that a delay was in effect. To code the first criterion, the label Y (for yes) was given if subjects indicated any pattern of behavior in which a response occurred on the reinforcement lever with no subsequent responding on the cancellation lever. Descriptions were coded with an N (for no) if the operative lever was not mentioned, or if the subject indicated that a press on the operative lever should be followed by a press on the cancellation lever. In cases in which the description was ambiguous, the statement was labeled with a question mark. Such statements can be categorized into two general types. In the first, the description was too vague to determine if the behavior described would be successful in producing points (e.g., "hit buttons for a few then wait not touching them"). In other cases, subjects indicated that both levers were to be pressed simultaneously. Such an attempt could result in an operative lever press occurring slightly after a cancellation lever press and would therefore be successful on those occasions. Finally, descriptions were coded with a D (for delay) if passage of time was indicated. For example the response, "I pressed the right key once & waited," would be coded with a D.

RESULTS

Two subjects, one from each delay condition, failed to follow instructions and answered questionnaires at inappropriate times. Data from these subjects were eliminated from the analysis. Data from individual subjects are presented in Figures 1 and 2 for the 10-s delay and 20-s delay groups, respectively. Except for Subject 1, all subjects exposed to a 10-s delay earned the maximum number of points (60) in under 75 min. In the 20-s delay condition, only Subjects 6 and 7 earned 60 points.

Comparing levels of responding on the reinforcement and cancellation levers is a rate-independent measure that demonstrates sensitivity to reinforcement contingencies. Allocation of the majority of responses to the reinforcement lever is indicative of learning. In the 10-s delay condition, only Subject 4 allocated proportionally more responding on the reinforcement lever across time. Although the total number of responses was greatest on the reinforcement lever for other subjects exposed to a 10-s delay, patterns of responding indicate that presses on the cancellation lever continued as part of a response chain. In response curves for Subjects 1, 2, and 3, decreases and increases in response rates were parallel on both levers. Responding first on the cancellation lever and then on the reinforcement levers followed by pausing produced these patterns. (Such a pattern was described by Subject 5 and can be seen in the Appendix.) Although responding on the two levers diverged early in the session for Subject 5, no reinforcers were delivered

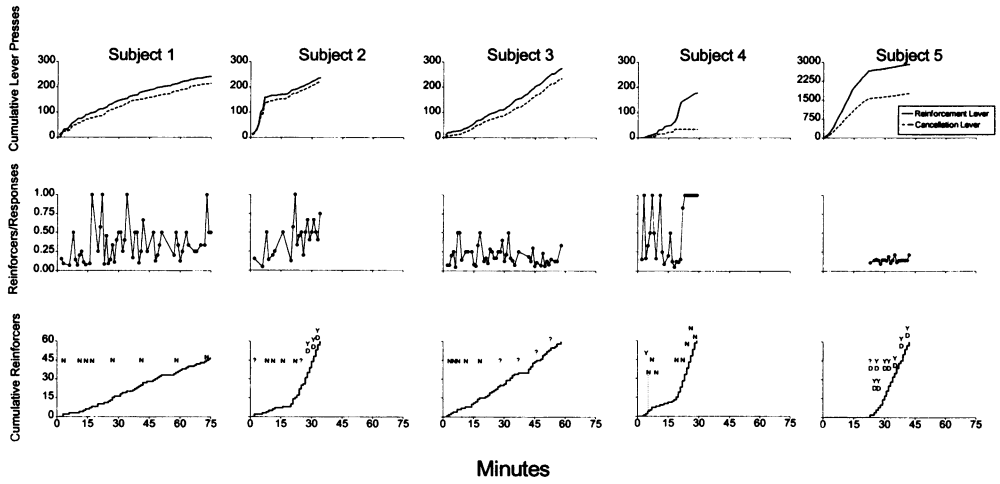

Fig. 1. Individual data from subjects exposed to a 10-s reinforcement delay. The top row of panels depicts cumulative responding on both levers. The center row depicts an efficiency measure calculated by dividing reinforcers earned by total lever presses. The bottom row depicts cumulative point deliveries and corresponding verbal descriptions coded as follows: Y = the description would produce points if followed as an instruction; N = the description would not produce points if followed; ? = not enough information was given for determining effectiveness of description; D = delay was indicated.

during the corresponding period; thus, the differential responding was not caused by any programmed contingency. Once Subject 5 began earning points, response rates on the two levers were roughly equal. In the 20-s condition, differential responding developed convincingly for Subjects 6 and 7. For Subjects 9 and 10, more responding was allocated to reinforcement lever, but responding on the cancellation lever continued throughout the session. Thus, the majority of subjects did not demonstrate learning convincingly according to this measure. But, the fact that 9 of the 10 subjects allocated more responding to the reinforcement lever may be suggestive of learning.

Another measure of learning is efficiency. Under a tandem FR 1 schedule, optimum efficiency would be one response per reinforcer. The second row of panels in both figures depicts the number of reinforcers divided by the number of lever presses in each minute in which a point was delivered. Because responses were recorded in 1-min bins, some point deliveries were displaced into the bin following the one in which they were actually earned. For example, a press 55 s into the first bin would produce a point 5 s into the second bin. Therefore, some individual data points may be imprecise, and data paths should be used to interpret trends only. Increases in efficiency over time may be indicative of sensitivity to both the resetting and cancellation contingencies. In the 10-s delay condition, an increase in efficiency over time was evident only for Subjects 2 and 4 with corresponding increases in reinforcement rates, as shown in the third row of panels. In the 20-s condition, only Subject 7 demonstrated increased efficiency over time. Thus, responding in the majority of subjects failed to come under precise schedule control.

The bottom row of panels in both figures depicts cumulative reinforcer deliveries and corresponding verbal descriptions, which were coded as described above. Complete descriptions are included in the Appendix. Specific attention was given to descriptions generated by Subjects 2, 4, 6, and 7

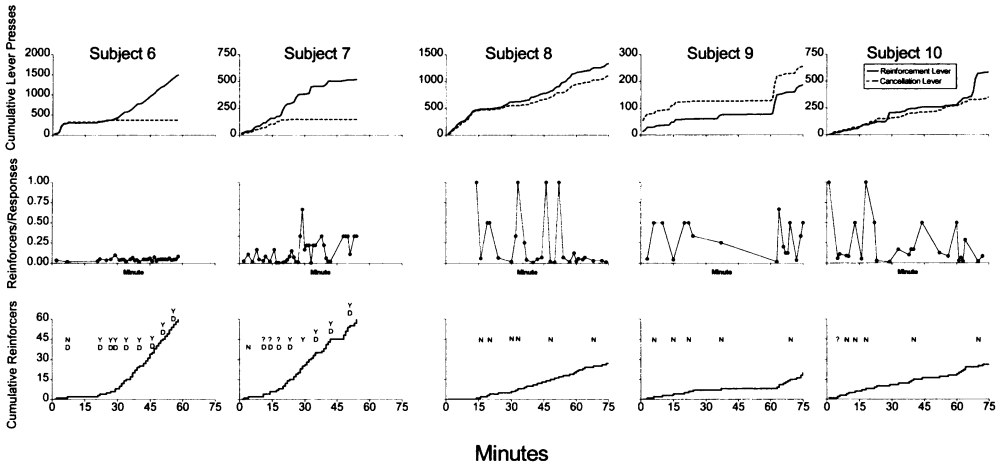

Fig. 2. Individual data from subjects exposed to a 20-s reinforcement delay. Details are as in Figure 1.

because these were the only subjects who demonstrated learning convincingly, as described above. Subject 2, who demonstrated increased efficiency over the course of the session, developed descriptions that would be effective in producing points, although they did include superfluous components (responses irrelevant to the contingencies). Subject 4 demonstrated increased efficiency over the session and emitted the majority of responses on the operative lever, but he was unable to describe the contingencies. In fact, only the first description generated would be effective in producing points if followed as an instruction; the others would not produce points because the appropriate operandum was not specified (e.g., "pushed start button 3 times"). Subjects 6 and 7 in the 20-s delay condition generated descriptions that would be effective in producing points but included superfluous components. For example, after earning 25 points Subject 6 wrote, "points awarded quite consistently after 20 Lefts (0 right) inputs and a short wait." Each subsequent statement indicated that the same pattern was maintained.

Of particular interest was whether subjects generated verbal descriptions identifying a delay. Mention of a temporal component was included in descriptions generated by Subjects 2 and 5 in the 10-s delay condition and Subjects 6 and 7 on the 20-s condition. Thus, of the 4 subjects who demonstrated learning convincingly, 3 of them described a delay contingency. Subjects 5 and 6 identified a delay contingency in their first description. Subject 7 described a delay after earning 4 points. Subject 2 did not describe a delay until earning 35 points. For this subject, the first description of the delay contingency corresponded to point in the session at which efficiency increased.

DISCUSSION

One of the main goals of this study was to assess whether subjects could generate descriptions that identified the presence of reinforcement delays. Four subjects were able to do so. However, it does not appear that the ability to verbalize the delay was necessary for acquisition. The performance of Subject 4 is of specific interest. Although, this subject allocated the majority of responding to the reinforcement lever and demonstrated optimum efficiency, he was unable to describe the delay or even indicate the appropriate operan-

dum. Given the growing literature on response acquisition with delayed reinforcement in nonverbal organisms, the evidence that learning can occur in the absence of the ability to verbalize the delay contingency is not surprising. What is more interesting is that 7 subjects earned points by emitting chains of responding on both levers followed by pausing, but they did not describe such pausing. The conclusion is that human beings may not always be aware of the control by delayed consequences over their nonverbal behavior.

Curiously, although the instructions were phrased in the present tense ("please describe how to earn points"), the majority of the verbal descriptions were phrased in the past tense. This struck us as odd. Upon hearing the mand, "Please describe how to get to the gas station," a speaker is unlikely to emit, "I drove a mile up the road," but would more likely say "Drive a mile up the road." In his analysis of guessing, Skinner stated that guesses often resemble tacts but may really be intraverbals (Skinner, 1957). When subjects could not describe the contingencies, the mand for doing so evoked a guess that was merely descriptive of recent behavior. Some descriptions were rather humorous in that they were very far removed from the causal relationship (e.g., "I sneezed and then it went on."). Because programmed reinforcement was not provided for correctly describing the contingencies, it is possible that there was no establishing operation for doing so. However, experimenters could hear subjects sliding chairs, tapping fingers, and hitting the response panel, and some of these unnecessary responses were described by subjects. We speculate that reinforcement delays provided the opportunity to emit irrelevant operants that were adventitiously reinforced.

Even when behavior is controlled by temporally contiguous consequences, human beings may be unable to generate accurate descriptions of contingencies. This was shown in a study by Svartdal (1989). In that investigation, subjects were told to count a series of auditory clicks and report the number by emitting a corresponding number of responses on an operandum. However, the actual contingency was arranged for response rate. Correct responses were indicated for increases or decreases in response rate as compared to baseline levels; the number of clicks was irrelevant. Although the programmed consequences modified speed of responding, subjects were unable to report the contingencies. Similar results have been obtained in other investigations of learning and awareness (e.g., Johnsrude, Owen, White, Zhao, & Bohbot, 2000; Rosenfeld & Baer, 1970).

The present investigation demonstrated that reinforcers delayed by at least 20 s can come to control human operant behavior. However, compared with a previous study in which rats were exposed to schedules of reinforcement identical to those used in the present study, the ability of delayed reinforcers to control behavior was demonstrated weakly. Although control of responding by the reinforcement lever was evident in 9 of the 10 subjects, it was demonstrated convincingly by only 3 of them. In contrast, Sutphin et al. (1998) reported that the majority of rats performing under the same reinforcement schedules for water came under primary control of the reinforcement lever. At 75 min into the session (the maximum session length in the current study), this was true in 7 of 8 rats exposed to an 8-s resetting delay and 5 of 8 rats exposed to a 16-s delay.

There are a few possible explanations for this discrepancy. Sutphin et al. (1998) used naive rats in their investigation. Very little lever pressing occurred during the first few minutes of acquisition. In contrast, humans undoubtedly have a long history with operanda similar to those used in the current investigation (e.g., the button on a computer mouse). Contact with such operanda typically produces immediate

consequences. Most likely because of this history, subjects emitted high rates of responding on the levers right at the beginning of the session. This prevented contact with the contingencies.

There are also important procedural differences. Sutphin et al. (1998) used water, a primary reinforcer. In the current study, point accumulation allowed the subjects to complete the session. Points were established as reinforcers by stating, "You will be done with the experiment as soon as you earn 60 points. Even if you earn 60 points very quickly, you will still be given two hours of research credit for your introductory psychology class." The efficacy of this establishing operation may have been weak. Although pilot data from our laboratory suggested that paying the subjects 10 cents for each point was no more effective in generating learning than the procedures used in the current study, the use of more potent reinforcers, such as money, may facilitate learning. It is relevant to note that reinforcer potency has been shown to be an important variable in nonhuman investigations of acquisition (Lattal & Williams, 1997). Another procedural difference involves the relation between the dimensions of the apparatus and the physical capabilities of the subjects. In the current study, subjects could place one hand on each lever simultaneously from their sitting position. This would permit rapid alterations between levers. In contrast, in the experiment by Sutphin et al., alternating lever presses would require the rats to reposition. This would have the likely effect of increasing interresponse times between cancellation and reinforcement lever presses. Longer interresponse times increase the likelihood of contacting delayed consequences.

One limitation of this study is the brevity of subjects' exposure to experimental conditions. It is possible that more learning would have occurred after repeated sessions. However, multiple sessions were contraindicated by the small size of the subject pool (<75) at the affiliated institution. During the course of the study, subjects would likely come into contact with each other in their classes and possibly share their knowledge of the contingencies. To minimize this potential problem, subjects participated in one session only, and the sessions were scheduled as close together as possible. Such precautions may not be necessary at larger institutions.

Regardless of the ambiguity of some subjects' performances, the current study demonstrated that human behavior can come under the control of delayed reinforcers. Together with results obtained by Rosenfarb et al. (1992) and Svartdal (1989), the present investigation adds further support to the notion that verbalizing contingencies is not necessary for learning to occur in humans. This holds true even when the efficacy of reinforcement is decreased by delay. Furthermore, although there is often a close temporal correspondence between acquisition and the self-generation of verbal behavior describing such control, one does not readily precede the other.

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APPENDIX

Self-generated written descriptions with corresponding point deliveries for each subject. Descriptions were transcribed verbatim; spelling errors, awkward punctuation, and irregular phrases were produced by the subjects.

Subject	Point	Description
1	2	First I lifted up the start box and a noise was made. I was given one point. Then I touched the white button above the point clock and received another point.
	4	The first thing I did was I looked to the left then I received a point. the second point was given to me by touching the middle red light.
	6	Push the switch down on the second clock (point). The touch the two screws at the bottom of the machine.
	8	First, touch the two screed diagonal to the point clocks. The touch the screen that says, "GO."
	15	First, position yourself more comfortable in the chair and you get one point. Then just look at the machine and get another point. Put your hand over the three red lights. Press the red button to the left of the start button. The press the start button. Touch the speaker at the bottom of the machine.

APPENDIX

Continued.

Subject	Point	Description
	25	First, just stare at the screen that says "GO." Then touch the response key box at the left. Touch the screen that says "GO." Press the button to the left of the start button. Touch the little white spot above the screw at the bottom of the machine. Peel a little bit of the tap to the right at the top right-hand of the machine. Press the button underneath the tap you just peeled. Rub your nose. Move your chair forward. Hold down the second point clock switch and release it.
	35	Touch the speaker again. Shake your head like you don't know how to figure this out. Look at the wooden box. Look at the point clock at the top. Hold down the switch to the second point clock and then release it. Look at the floor and then at the bottom of the machine. Pres the unmarked red button on the silver box. Touch the space above the speaker. Wisper "go" into the speaker. Touch the white spot at the bottom of the machine again.
	45	Scratch your elbow. Touch the two second to last screws to the left of the machine. Place all five right-hand fingertips on the middle of the machine. Open the wooden box and look inside. Look at the response key box. Press the unmarked button the the start box. Lean your head against the machine. Touch the little screen that has tape over it. Touch the first point clock switch, but don't press it. Look at what you've written so far.
2	2	?? press response key on left
	4	Well I pushed the machine but I don't think that did anything. THIS IS HARD!
	6	I just touched the machine but I don't think it did anything. I should have listed to the directions better. I'll try again.
	8	Maybe you have to touch the metal things
	15	THIS IS VERY FRUSTRATING! I keep just touching the machine but I still don't know how to get these stupid points.
	25	I got a lot of points in a row by pressing the left response key, then the right RK, and then shaking the machine w/my hands on the two center outside panels.
	35	Got it. Press the Left response key, then the Right response key & wait 10 seconds. No shaking required.
	45	Same as before. Press the left response key (not your left) and then the right. Wait 10 seconds and viola, you get your point. WOO HOO.
	55	Same. Maybe it's more like 9 seconds between your last hit of the response key
3	2	Covering up certain objects. I think maybe in a certain sequence.
	4	I'm not sure that there is any specific way. It's not by doing the same thing twice because the points aren't given when I do the thing that gave e the last point.
	6	By touching everything continuously until the points are given.
	8	I honestly couldn't even guess. I get the points at different times every time.

APPENDIX

Continued.

Subject	Point	Description
	15	Hitting both response keys and the covering the go sign and all of the little light things.
	25	Hit both response keys, the cover up both things on each top corner, then cover up the go sign and the Light things.
	35	Hitting both response keys at the same time, the cover up the go sign and the Light things at the Same time. After 3 times you earn points.
	45	Hitting both response Keys at the same time, then covering up the go sign at the same time. But this only works after you do it a few times.
	55	Hitting both response keys at the same time, then covering the go sign, and the 3 Light things at the same time. Every other time you do this you earn a point
4	2	Pushed response key on left
	4	Pushed button next to start
	6	Pushed start button
	8	Pushed response key on right
	15	pushed start button
	25	pushed start button
	35	Pushed start button
	45	Pushed start button 3 times
	55	response key - right start button button next to start
5	2	hit buttons for a few then wait not touching them
	4	hit two on the Rt, two on the left, one rt, one left, one rt. Give time for response.
	6	two rt two L 1 Rt 1 L 1 Rt pause for response
	8	2 rt 2 L 1 rt 1 L 1 Rt pause
	15	2 rt 2 L 1 rt 1 L 1 Rt wait
	25	2 rt 2 L 1 rt 1 L 1 Rt wait
	35	2 rt 2 L 1 rt 1 L 1 rt wait 6 mississippi's
	45	2 rt 2 L 1 rt 1 L 1 rt wait 6 mississippi's
	55	2 rt 2 L 1 rt 1 L 1 rt wait 6 mississippi's
6	2	wait for time to go by. First two → points were given while I was idle(not making inputs) I suspect I will get a (another) point without any input-just time. I'll time next interval and give no inputs. Waited 10 minutes, made no inputs got no inputs. No think inputs are necessary - maybe a time elapse after some sort of input. Will restart inputs.[a]
	4	red light came on in 10 mins now think some input is necessary to get points - and some time needs to elapse after the input(s) restarted at 12:30 00 point after 20 left inputs and a few seconds. 20 right inputs waited - no point 20 left inputs waited - point
	6	Beginning to think left inputs + waiting workes - will continue restarted 12:34 00
	8	More confident now that 20 Left inputs and a short wait yield points. will continue restarted 12:36 00 20 left inputs 20 secs wait

APPENDIX

Continued.

Subject	Point	Description
	15	getting closer to answer points are consistently rewarded after Left inputs and short wait will continue restarted 12:41 00 20 lefts 10 secs wait points awarded consistently
	25	points awarded quite consistently after 20 Lefts (0 right) inputs and a short wait restart 12:47 have 30 points now. @ 3 points/minutes can be done in another 10 minutes. Can't wait to find out if there is a faster way.
	35	can't help but wonder if there is a faster way, but have 40 points now (12:52) and think I should continue as it is going well. some what bored but will take the sure thing and a 1:00 finish. As I have a lot to do this afternoon
	45	see # 7
	55	See # 7 probably haven't optimized this test. Can't really say why
7	2	I didn't do anything
	4	I pushed the two levers who knows how many times then just waited again
	6	I pushed both levers many times and then waited
	8	I pushed the response keys many times then again I waited.
	15	I pushed the key on the right many times then waited
	25	I held down the right key and the points seemed to go Faster
	35	I pressed the right key once & waited. It took about the same amount of time as holding the key down. I tryed just pressing the left one, but it was taking too long, I didn't feel like waited, so I pressed the right one. It seemed to take about 30 secs. After I pressed the right one For a point to be added.
	45	I pressed the right key once & timed how long it took to get a point. It took about 20 secs From when I pressed it. I did this 3 times & it was consistent. I held down the right key & timed how long it took to get a point. It took about 20 sec.s I did this twice. I pressed the right key continuously for 25 sec. To see if I would still get a point after 20 sec. From the 1st time I pressed it. I didn't work. I then got a point after waiting about 20 sec. From the last time I pressed it.
	55	I think you get a point by pressing the right key 1 time then waiting 20 sec.s and/or by holding the right key down for 20 sec.s.
8	2	I have no idea why that red light went on.
	4	I think it is when you hold both response keys down at the same time.
	6	I am completely confused. The Last thing I did was lean back in the chair and stare at the machine, and I know that didn't earn me any points.
	8	I didn't touch the keys once, and I just got tow more points. Maybe you just don't touch the keys.
	15	I must be getting sympathy points or something. I just keep hitting the keys back and forth in frustration.
	25	I don't have any idea why I'm getting points. At first, alternating between the two keys worked, I thought. But now I guess not.

APPENDIX

Continued.

Subject	Point	Description
9	2	Block the light sensor. Let light hit it again.
	4	I have no control over points, except to pull the reset lever. I have not since the beginning of the experiment.
	6	At least I can have fun resetting points. Maybe I should reorder the leads or stick them into the electric socket, since I still have *no* control over the points.
	8	Well, if I can't succeed, at least I can fail. I haven't tried speaking aloud, but silence *is* golden is it not? Still no control.
	15	I still doubt that I can change what happens at all. Probably someone controls the point count manually. At least I can stop myself from 'winning.'
10	2	I pushed the response key on my left
	4	I have no idea what I did it just turned on. Wait . . . maybe I moved
	6	I think it happened because I waved my hand in front of the mech.
	8	I leaned in and looked at the mech. I starred at the light and it *lite up*!
	15	I was playing with the knobs on the back of the Response Key to my left.
	25	Person came in and Turned off the light. I am not sure if that is part of this or not.
	?	I sneezed. Then it went on.[b]

[a] Subject did not generate this rule at appropriate time.
[b] Subject gave extra rule, therefore at least one was given at an inappropriate time.